

Revision 3: Cornea – Sclera – Conjunctiva

Dr. Muhamad Abu-elmaaty

1. Define the following.....

Corneal abrasion	• It is loss of the corneal epithelium without affection of BM.
Keratitis	• It is inflammation of the cornea.
Corneal ulcer	• It is loss of the corneal epithelium with affection of BM (loss of superficial layers).
Nebula	• Faint, superficial corneal scar and iris is seen through it.
Hypopyon ulcer	• It is 1ry superficial infective serpiginous disc shaped corneal ulcer associated with Hypopyon & severe iritis (acute serpiginous ulcer).
HSV keratitis (Dendritic ulcer)	• It is superficial infective linear branching ulcer, dendritic in shape ending in knots caused by epitheliotropic 2ry HSV type 1.
Bell's phenomena	• It is upward rotation of the eyeball during closure of eyelid.
Neurotrophic keratitis	• Loss of corneal sensation → trophic changes "HZO" is the commonest cause.
Arcus senilis	• It is bilateral, peripheral lipid (fatty degeneration) of corneal stroma in elderly
Keratoconus	• Conical protrusion of the central part of the cornea that starts at puberty due to weakness of the central part of the cornea "it is bilateral & progressive".
Keratoplasty	• Removal of diseased part of cornea and replacing it with a clear donor's graft.
Staphyloma	• It is an ectasia of outer coat of the eyeball in which uveal tissues is showing.
Episcleritis	• It is localized inflammation of the sub-conjunctival tissues which may involve the superficial layer of the sclera. <i>may be nodular or not nodular.</i>
Scleritis	• Inflammation of all layers of the sclera usually involve cornea, uveal → serious
Synechia	• Adhesion of the iris with either periphery of posterior surface of cornea → PAS or anterior surface of lens → posterior synechia.
MPC	• It is an acute conjunctivitis characterized by hyperemia of the conjunctiva and mucopurulent discharge.
Membr. conjunctivitis	• It is a severe form of acute conjunctivitis characterized by: Hyperemia, sanguineous purulent discharge, Membrane formation, Corneal ulcer, and general manifestations.
Ophthalmia neonatorum	• Any form of acute conjunctivitis occurring in the newly born in the first 4 wks.
Trachoma	• Chronic infective keratoconjunctivitis caused by Chlamydia trachomatis ccc the formation of Follicles, Papillae, Pannus and heals by cicatrization.
Pannus	• Vascularization & infiltration of superficial corneal layers by chronic inflamm. cells.
VKC / spring catarrh	• It is chronic bilateral seasonal recurrent conjunctivitis ccc Itching, photophobia lacrimation and ropy discharge → d2 allergy to exogenous toxins.
Phlyctenular conjunctivitis	• Chronic allergic conjunctivitis or keratoconjunctivitis in response to an endogenous antigen.
Pinguecula	• Degenerative condition occurring in old age ccc by yellow nodules nasal to limbus.

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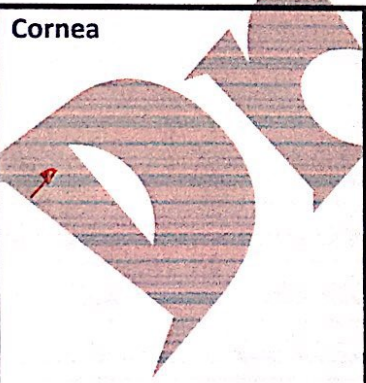
Pterygium ↗	• Triangular encroachment of the conjunctiva onto the cornea with tendency to nasal site.
Symblepharon ↗	• It is adhesion of the lids to the globe.
Ankyloblepharon ↗	• It is adhesion of the 2 lids.
Chemosis	• Edema of subepithelial CT (Stroma) of the conjunctiva.
Keratectesia	• Forward bulging of weakened cornea (by trachoma).

2. Mention the functions of.....

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Corneal endothelium ↗	• Endothelial pump: is important for maintaining a state of corneal dehydration by taking H₂O from it and secrete it back into A.ch → maintains transparency. • It secretes the Descemet's membrane: if injured → regeneration.
Limbus → Contain stem Cells	• It is Important anatomical & surgical landmark e.g. in glaucoma and cataract surgery. Chanal of schlem
Cornea ↗	• Refractive function: the cornea is the main refractive media → 42D. • Protective function: through corneal sensation → corneal reflex.
Conjunctiva ① L tissue ② Goblet's cell ③ Flora	• It contains abundant lymphoid elements: Defense mechanism. • It supplies the precorneal tear film with aqueous, and mucus layer. • It contains normal conjunctiva flora: - Staph Albus and Diphtheroid (Xerosis bacilli): secrete antibiotics, which inhibits some pathogenic strains of bacteria attacking the conjunctiva. - Diplococci like pneumococci. - Saprophytic fungi.

3. Anatomy / Enumerate Layers of.....

Cornea 	Transparent anterior 1/6 of the outer coat of the globe. 77 • Gross anatomy: - Transparency: Transparent, avascular except 1mm at limbus. - Measurements: a. Diameter (vertical: 11 & horizontal: 12). b. RI: 1.37 / R Power: 42D. c. Thickness: (central thickness = 500 - 600 u, increases gradually towards the corneal periphery to about 800 - 1000 u). • Minute anatomy "Layers": the cornea is formed of 5 layers. سؤال لو حده a. Epithelium: Stratified (5-6 layers thick) squamous non-keratinized epithelium & quickly regenerates. → heal by fibrosis. b. Bowman's membrane: Clear structureless elastic membrane cannot regenerate. c. Stroma: The thickest part of cornea 90% & formed of 100-150 transparent regular lamellae. d. Descemet's membrane: elastic membrane (Just above endothelium)
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	& Secreted by endothelium. e. Endothelium: Single layer of hexagonal and flat cells & It is important for corneal dehydration. Nutrition: Avascular (except one mm. at the limbus) & nutrition is obtained by diffusion from: CAP a. Circum-corneal: Limbal capillaries. b. Anterior chamber (AC): Aqueous humor. c. Precorneal: Tear film. Nerve supply: 5th → Ophthalmic → Nasociliary → 2 long post Ciliary nerves. Functions: see above.
Limbus ↗	It is the transitional zone (1.5 mm width) between the cornea on one side and the conjunctiva and sclera on the other side. Layers: 1- Corneal epithelium → 12 layer..... 2- B.M → stop..... 3- Corneal stroma → irregular..... 4- DM → schwab's line..... 5- Corneal endothelium → iris & angle..... Functions: see before.
Sclera ↗	Opaque posterior 5/6 of the outer coat of the globe. The sclera is composed of three ill-defined layers: 1. Episclera: A loose fibrous and elastic tissue. 2. Sclera proper: Like the cornea, it is made of bundles of C T but their arrangement is Irregular. 3. Lamina fusea: Composed of elastic fibers and lined by pigmented cells (chromatophore) giving the Internal aspect a brown color.
Eye ball / coats of eye ↗	Outer fibrous / protective coat: - It is fibrous in structure and protective in function. - Ant 1/6: transparent cornea / post 5/6: opaque sclera with limbus in (). Middle vascular / nutritive coat: - It is vascular in structure and nutritive in function. - It is formed of, iris ant, ciliary body in the middle and choroid post. Inner neural coat: - It is formed of retina, which is neural in structure and visual in function.
Conjunctiva ↗	Epithelium: It is stratified squamous non-keratinized epithelium. 12 layer Substantia propria: It consists of 2 layers: a) Superficial adenoid layer: Consists of loose C.T & contains Lymphocytes & It is formed at the age of 3 months, so the follicles never formed before this age. b) Deep fibrous layer: It contains the main blood vessels and nerves.

3. Mention 5 clinical signs of

Corneal abrasion	Cornea: Hazy. خافه و ماضي Slit lamp: loss of corneal epithelium + faint fluorescein staining.
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Corneal ulcer	• Lid: Edema. • Conjunctiva: Chemosis – Red eye. • Cornea: لازم تكتب a. Loss of corneal luster. b. +Ve fluorescein staining → the ulcer stains green. c. Grayish infiltration. d. Hypoesthesia in dendritic ulcer & keratomalacia and loss of sensation in neurotrophic ulcer & HZO. • A. Ch: Signs of accompanying iritis: Flare / Hypopyon.
Corneal Fistula	• A. Ch: Lost AC. • IOP: Soft tension. • Fluorescein test & slit lamp: Green River Sign (Seidel test).
Hypopyon Ulcer	• As in corneal ulcer but it has: a. Paracentral ulcer: Disc shaped ulcer with advancing undermined edge progress centrally & healing edge, which is vascularized. b. Hypopyon in A. Ch: (Sterile pus due to toxic iritis) & It is formed of (P.N.L + pigments + fibrin). c. Regurgitation test: is usually + ve (dacryocystitis).
HSV (Dendritic) keratitis Branching central ulcer ending in rounded knobs.	• Eye lid / skin: Vesicles. • Cornea: Dendritic ulcer + الوصف كاملا • Hypoesthesia & double staining: F / rose Bengal. • Conjunctiva: follicles.
VZV / HZO	• Skin: maculopapular rash "never cross middle line" → vesicles → 2ry infection → pustule → scarring → Trichiasis / ectropion & healing with depressed scars. • Cornea: punctate keratitis / dendritic lesion with small dendrites e out knots. • Scleritis & Episcleritis / 2ry iridocyclitis with sectorial iris atrophy. • Acc. To affected nerve: - 3,4,6: paralytic squint. - 2nd: optic neuritis. - Naso-ciliary of ophthalmic: cornea / uvea / Hutchinson's sign → vesicles at tip of nose "early sign of corneal affection" مهمه جدا.
Fungal keratitis	• History of CL wear with bad hygiene. • Conjunctiva: Little or no conjunctival injection. • Cornea: - Epithelial lesion → Feathery edges, Raised, dry & gray-white lesion. - Stromal deep infiltrate → Satellite around the lesion. - Cheesy Hypopyon with irregular upper border.
Keratomalacia	• Loss of corneal luster: followed by appearance of yellow dots of necrosis at center of the cornea, which is bilateral. • Melting of the cornea: d₂ necrosis + Iris prolapse total ant. staphyloma. • Corneal hypoesthesia / 2ry infection may occur: endophthalmitis.

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Neurotrophic k.	• Large deep central ulcer (liable to perforate). • Corneal anesthesia no .../.../...
Keratoconus	• Central part of the cornea is cone shaped which can be seen by: - Profile view. - Notching of lower lid on down looking (Munson's sign). مهمة • Slit lamp shows: - Thin apex of the cone and deep A.C. - Folds of Descemet's membrane (Vertical stria of Vogt). - Fleischer ring: Brown ring at the cone base. • Direct ophthalmoscopy: shows an 'oil droplet' reflex. • Retinoscopy (red reflex): Spinning (scissoring) red reflex. • Placido disc: Ring distortion due to irregular corneal surface. • Keratometry. • Deep opacity at the apex of cone at late stage.
Episcleritis	• Localized redness: with or without nodule. • Tenderness on pressure. • The nodule: is lentil in size, 1-2 mm. from the limbus, purple, fixed to the sclera and the conjunctiva moves over it. It never suppurates or ulcerate.
MPC	• Lids: - Edema. - The lashes are glued together by the discharge. • Conjunctiva: - Mucopurulent discharge. - Conjunctival injection which is most marked in the fornices. - chemosis / Petechial hemorrhage especially in pneumococcal cases.
PC	• As before but..... Dr. Muhamad Abu-elmaaty
Ophthalmia neonatorum	• Gonococcal: - It occurs 3: 5 days after birth / Copious purulent or sero-sanguinous discharge. - Complications: Corneal ulcers, perforation and endophthalmitis. • Chlamydial: - No follicular response in newborn + Mucopurulent discharge. - Pseudomembranous reaction on tarsal conjunctiva. - Intra-cytoplasmic inclusion bodies stained blue with Geimsa.
VKC,	• See below = types.
Phlyctenular conjunctivitis	• Conjunctival manifestation: - <u>Phlycten nodule on bulbar conj:</u> - Shape: Rounded raised nodule. Size: 1-3 mm in size. - Site: At limbus and bulbar conjunctiva. Color: Grayish or yellow. - Surroundings: A small area of congestion. Content: Lymphocyte. • Corneal manifestation: - <u>Corneal phlycten</u> (Superficial or deep to BM). - <u>Ph. Ulcer:</u>

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	a. Limbal (Marginal): Single or multiple that may fuse to form a ring ulcer. b. Fascicular: - Superficial ulcer that creeps in a serpiginous manner towards the center, Supplied by a leash of blood vessels. - On healing, its track leaves an opacity (Maximum where it stops).
Pterygium	• Site: On the nasal side, less commonly temporal. • Shape: Is triangular and consists of - Apex: lies over the cornea and may grow to reach pupillary region. - Neck: overlies the limbus. - Body: lies over the sclera.
Dry eye (Xerophthalmia)	• Schirmer's test: Deficient tear production measured by filter paper. • Tear film break up time (BUT): Diminished. • Rose Bengal stain: The degenerated epithelium of conjunctiva, cornea and mucus are stained red. • Punctate epithelial erosion of cornea.

4. Enumerate types classify...

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Keratitis	• Superficial Keratitis: It is primarily affecting the epithelium and the superficial corneal lamellae. • Interstitial Keratitis: It is primarily affecting the stroma and epithelium is intact. • Deep Keratitis: It is primarily affecting the endothelium, Descemet's membrane and the posterior corneal lamellae.
Keratoplasty	• Lamellar "super" Keratoplasty: replacement of the corneal lamellae 'ant/post'. • Penetrating "deep" Keratoplasty: replacement of the full thickness cornea.
Staphyloma	• Anterior staphyloma: - It is an ectatic scar of the cornea in which the iris is incarcerated. - It usually results from perforation of a large corneal ulcer. • Intercalary staphyloma: It is lined by root of iris. • Ciliary staphyloma: It is lined by ciliary body. • Equatorial staphyloma: It is lined by the choroid. • Posterior staphyloma: - It occurs at the posterior pole of the eye, temporal to the disc. - It is detected by the ophthalmoscope and ultrasonography.
Synechia	• Anterior synechia: adhesion of iris e posterior surface of cornea = PAS. • Posterior synechia: adhesion of pupillary surface with anterior surface of lens. - Ring synechia: () whole pupillary ring & lens capsule = seclusion-pupillae. - Partial posterior synechia: festooned pupil when the pupil is dilated. - Total posterior synechia: complete adhesion () iris back & lens capsule.
Conjunctivitis	• Infective conjunctivitis: it may be Acute infective conjunctivitis: - Bacterial: May be classified according to the nature of the disease into : Mucopurulent / Purulent / Membranous.

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	- Chlamydia: Trachoma. - Viral conjunctivitis: adenovirus. HZV. HSV. ii. Chronic infective conjunctivitis: Trachoma / Follicular / Angular / Specific infection (tuberculosis or syphilis). • Non-infective conjunctivitis: It may be Allergic: ممكن لوحدها Allergic simple conjunctivitis / Spring catarrh (VKC) / Phlyctenular conjunctivitis. Traumatic and chemical (Irritative conjunctivitis).
Trachoma	✍ Mac Callen's classification: - T₁: Small trachoma follicles: - T₂: T_{2a}: Typical follicular trachoma. T_{2b}: Papillary trachoma. T_{2b1}: Trachomatous papillae and flat-topped spring catarrh papillae. T_{2c}: Papillary trachoma and gonococcal conjunctivitis. T_{2v}: Plasma cell infiltration and hyaline degeneration of the conjunctiva. - T₃: Stage of cicatrization. - T₄: Healed trachoma. ✍ WHO classification of trachoma: It includes five signs (F.I.S.T.O.). Trachomatous follicular (TF): Presence of 5 or more follicles in upper tarsal conj. Trachomatous intense (TI): intense inflammatory thickening of upper tarsal conj. Trachomatous scarring (TS): Scars in the tarsal conjunctiva and Arlet's line. Trachomatous trichiasis (TT): Eyelash rubs on the eyeball. Corneal opacity (CO): Corneal opacity over the pupil.
VKC	It has three types: • Palpebral Type (70%): The upper tarsal conjunctiva shows characteristic papillae. - Large flat-topped papillae. - Polygonal appearance (cobblestones). - If the papillae are left exposed for 1-2 minutes a milky white film form which is sticky and is rich in eosinophils. - Fornix always free. • Bulbar type (10%): - Gelatinous masses: D₂ thickened epithelium and hyaline degeneration, occur around the limbus. - White spots (Tranta spots): may be seen within these masses due to aggregation of eosinophils + epithelial debris + calcium deposits. • Mixed type (20%).
Symblepharon	• Anterior: adhesion of palpebral conjunctiva near to lid margin to eyeball. • Posterior: adhesion obliterating fornix. • Total: the posterior surface of lid is totally adherent to the globe.
Pannus	• Trachomatous pannus: chlamydia / upper part / serrated edge / branching Vs. - Thin pannus (pannus tenuis). - Thick pannus (pannus carnosus). - Vascular pannus (pannus vasculosus). - Annular pannus. - Dry pannus (Pannus siccus).

- **Degenerative pannus:** absolute glaucoma / anywhere / few Vs / irregular edge.
- **Leptotic pannus:** leprosy / anywhere / few Vs / irregular edge.
- **Phlyctenular pannus:** allergy / anywhere / straight Vs / rounded edge.

6. Give 5 complications..

Keratoplasty

- **Pre-operative:** complications of Retro bulbar anesthesia (retrobulbar hematoma -globe perforation - Optic nerve damage). سؤال
- **Intra-operative:** dry eye - traumatic injury to: iris /cornea / EOM.
- **Post-operative:** graft rejection "Ag-Ab reaction" / recurrence of the original disease in the graft / infection: endophthalmitis.

7. Give 5 drugs used in ttt of..

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Dendritic keratitis

- **Local antiviral drugs:** inhibit viral DNA synthesis e.g. Acyclovir "Zovirax" 3% ointment 5 times/ day, IDU 0.1% drops every 6 Hrs., vidarabine or Trifluorothymidine.
- **Atropine 1% drops (t.d.s) / local antibiotics:** for 2ry bacterial infection.

Spring catarrh / VKC

- **Local Cortisone drops** e.g. fluometholone then withdraw gradually.
- **Mast cell stabilizer drops** e.g. lodexamide 0.1% 4 times/day or sodium chromoglycate 4% 4 times daily.
- **Local antihistaminic / local VC** as adrenaline for hyperemia.

MPC

- **Antibiotic drops / ointment:** to kill organism: teramycin / Cipro 0.3 T.D.S.
- **Antiseptic lotion:** boric acid 4% / NaHCO₃ 3% T.D.S: to remove discharge.

Corneal ulcer

- **Topical antibiotic:** broad spectrum as ciprofloxacin 0.3% 5min/30min – 30min/24 hrs. – according to response.
- **Atropine 1%:** as above.

Ophthalmia neonatorum

- **Prophylactic antibiotic eye drops after birth:** tobramycin.
- **Erythromycin** 12.5 mg/kg oral every 6 Hrs./day for 14 days.
- **Ceftriaxone** 25mg/kg IM for gonococci.

Phlyctenular conj

- **Local cortisone drops / ointment:** as above.
- **Atropine 1% if cornea is involved:** as above.

8. Give short account on..

Complications of corneal ulcer

- **Non-perforated corneal ulcer:** 2ry uveitis / 2ry glaucoma / Corneal complications [Descemetocoele (Early) - Corneal scar "nebula & leucoma non adherent" (Late) - Healing abnormalities "Corneal facet / Keratectesia / Pseudo pterygium" (Late)].
- **Perforated corneal ulcer:**
 - a. **Paracentral (peripheral) perforation:** (Small perforation→PAS & Large perforation→L. adherent / ant. staphyloma).
 - b. **Central perforation:** (Small perforation→L. non-adherent & Large perforation→ C. Fistula - Atrophia bulbi / infection of eye / hypotony).

Complications of trachoma

- **Lid:**.....
- **Conjunctiva:**.....
- **Lacrimal:**.....
- **Cornea:**.....